NOTE XVII.

NEW SPECIES OF THE GENUS
MEGASCOLEX TEMPLETON (PERICHAETA SCHMARDA)
IN THE COLLECTIONS OF THE LEYDEN MUSEUM

BY

Dr. R. HORST.

Having completed the examination of the Earthworms, brought home by the Sumatra-Expedition [1]) and destined to be deposited in the collections of the Leyden Museum, I was surprised to find in the latter some specimens of tropical *Lumbricina*, hitherto not described. These specimens, being collected a long time ago by von Siebold, Kuhl & van Hasselt and Horstock, are not in a very good state of preservation (as was also the case with the worms from the Sumatra-expedition), and so I regret to be not able to give always so exact a description, as should be desirable. Before undertaking the description of the different species, it will be necessary to give some details about the history of the genus *Megascolex*, because there seems to exist a good deal of confusion concerning that generic title. The genus *Megascolex* has been based by Robert Templeton [2]),

---

[1]) Midden-Sumatra, IV. Natuurl. Historie, 12e Afd. Vermes, door R. Horst. (in press.

[2]) Ann. a. Mag. N. H. Vol. XV, p. 59.

in the year 1845, upon large worms found in the Alpine regions of Ceylon, which had each ring in the middle of its length dilated into a ridge, which carries on it, except in the mesial line of the back, minute conical mamillae, 100 in number, each surmounted with a minute bristle. The author gives some annotations concerning the anatomical structure of these worms, the situation of the pores on the back etc. and concludes that without any doubt they are closely allied to *Lumbricus*. About fifteen years after the publication of Templeton's paper Schmarda [1]) created a new genus *Perichaeta*, based on earthworms, also natives of Ceylon, characterized by having each segment surrounded in the middle by a circular ridge, which is beset over the whole circumference of the body by a row of bristles. In describing this new genus Schmarda mentiones also the genus *Megascolex* of Templeton, but unfortunately he seems to have misunderstood Templeton's description, for he says, that the genus *Megascolex* is quite different from *Perichaeta* by having only a row of bristles on the back, whereas the only difference is that in *Megascolex* the bristles are wanting in the mesial line of the back. The same mistake is made by Grube [2]), who in his classical work „Die Familien der Anneliden" erroneously characterizes the genus *Megascolex* by »Rücken mit borstentragenden Papillen bedekt (reihenweise längs den Seiten stehenden Borsten fehlen)". He certainly has much contributed to the error finding its way also in other books; so Vaillant [3]) in his table of the classification of the Earthworms repeats: »soies sur des papilles rassemblées à la partie dorsale".

The only author who calls the attention upon Schmarda's mistake is Baird [4]); he also examined the type-specimens

---

1) Neue wirbellose Thiere, 1861, Bd. I, 2, p. 13.

2) Die Familien der Anneliden, 1851, p. 144.

3) Ann. Sc. natur. 5e Sér. Zool. T. X, p. 254.

4) Proc. Z. S. L. 1869, p. 40.

of *Megascolex coeruleus* and could not find any characteristic difference between *Perichaeta* and *Megascolex*. His conclusion, that both genera are identical, I believe to be quite exact and consequently the name *Perichaeta* must be cancelled, while *Megascolex* has indisputable claims of priority. We must regret that Perrier [1]), who afterwards has so much contributed to our knowledge of the genus *Perichaeta*, not only has fallen into the same error above referred to, but moreover that he imputes Baird from having confused the genus *Perichaeta* with *Megascolex* (Rech. p. s. à l'hist. des Lombr. terr. Nouv. Arch. Mus. Hist. Nat. T. VIII, p. 153).

We are indebted to Leon Vaillant (loc. cit.) for having not only pointed out the great differences between *Megascolex* and *Lumbricus*, but also for having understood that there must be taken account of the internal anatomical characters, to distinguish the species of these worms, which show so great a conformity in their external appearance. He demonstrated the formation of the girdle by three segments, the situation of the male genital orifices behind the girdle, the absence of true segmental organs, the presence of a gland near the opening of the vasa deferentia and of a pair of coeca on the intestine in the 26th (23th Vaill.) segment. Those observations were afterwards confirmed and augmented by Perrier; he pointed out that the girdle is constituted by the 14th, 15th and 16th segment, that the male genital orifices are situated on the second ring behind the cingulum (18th segm.) and demonstrated also the uneven orifice of the oviduct on the ventral side of the first girdle-segment (14th).

In his ample memoir »Recherches pour servir à l'histoire des Lombriciens terrestres'' Perrier gives a description of six new species, accompanied by many anatomical de-

---

[1]) In his historical review on the Earthworms Perrier mentiones *Perichaeta* instead of *Megascolex* as one of the genera, classified by Grube in the family of Lumbricina; this must be a mistake, because the genus *Perichaeta* was formed 10 years after the publication of „Die Fam. der Anneliden''.

tails, and points out that the knowledge of the number, the situation and the shape of the copulatory pouches is of great value to recognize the different species. In the year 1875 the same author made a preliminary communication [1]) about some new species of *Megascolex* (*Perichaeta*) from the Philippine-Islands, in which he stated that the number of segments, composing the girdle, not always amounts to three, but in some species counts only two, whereas in other ones it reaches four; moreover he observed that in two of these species the bristles are not present on the whole circumference of the body but that they there fail on the ventral side. However we must wait for his more detailed communications before being able to decide if those species really must be ranged under the genus *Megascolex*. Yet it may be added that the arrangement of the bristles is not quite the same in all species, as I examined a species from Sumatra (*M. Hasselti* n. s.) that has its bristles on the ventral side not placed on equal distance as those of the back, but crowded together in two groups, one on each side of the mesial line of the belly. This peculiar arrangement of the bristles is associated with a particular structure of the longitudinal muscle-bands, which show on transverse sections the shape of a feather, quite like the longitudinal muscles of *Lumbricus*, a structure which hitherto has not been observed in any other species of *Megascolex*. Several species of the genus *Megascolex* (*Perichaeta*), natives of the Oriental, Australian, Aethiopical and Neotropical Regions [2]), already have been described, but some of those descriptions are short and incomplete, and in other ones we

---

1) Compt. Rend. T. LXXXI, p. 1043.

2) The species forwarded to Darwin from Nice, and those met with by Baird and Vaillant in hot-houses in England and France, may not be taken account of, being certainly introduced with plants from tropical regions. Those examples tell us that earthworms, though destitute of means of moving and confined to the soil in which they live, are very easily transported with plants from one country into another, and we may be very cautious in making conclusions from their geographical distribution with regard to the geological condition of lands in past epochs. (Vide Ray Lankester, Phil. Trans. R. S. Vol. 168, p. 264).

find only mentioned insignificant external characters, so it is often impossible to recognize the species of different authors. As uncertain species must be considered: *P. leucocycla* Schm., — *viridis* Schm., — *cingulata* Schm., *brachycycla* Schm., (from Ceylon)[1] — *corticis* Kinb. (Oahu)[2], *diffringens* Baird (England)[3], — *bicincta* Perr., — *luzonica* Perr., — *coerulea* Perr., — *biserialis* Perr. (Philippine Isl.), — *Juliani* Perr. (Saigon)[4], — *rodericensis* Gr. (*Rodriguez*)[5], — *subquadrangula* Gr. (Viti Levu)[6], — *taitensis* Gr. (Tahiti)[7]. Only the following 6 species, are well characterized: *P. Houlleti* Perr. (Calcutta), — *posthuma* Vaill. (*affinis* Perr.)[8], from Java, Cochinchina and Philippine-Islands, — *robusta* Perr. (Mauritius and Manilla), — *aspergillum* Perr. (hab. ign.), — *quadragenaria* Perr. (East-India), — *elongata* Perr. (? Peru)[9].

Megascolex indicus n. s.[10]

Cephalic lobe extending over two thirds of the length

---

1) loc. cit.

2) Annul. nova, Öfvers. Svenska Vetensk. Akad. Forh. 1866, p. 97.

3) loc. cit.

4) Only known by a preliminary description. Compt. rend. loc. cit.

5) Phil. Trans. R. S. Vol. 168.

6) Annel. Ausb. S. M. S. Gazelle Monatsber. Berl. Acad. 1877.

7) Reise Oesterr. Freg. Novara, Anneliden.

8) Without doubt these two species must be considered to be identical; they would be distinguished by the different situation of the copulatory pouches, Vaillant stating that the orifices of those organs are situated in *P. posthuma* between the 3th and 4th, 4th and 5th, 5th and 6th, 6th and 7th segment, whereas in *P. affinis* they would be placed between the 5th and 6th, 6th and 7th, 7th and 8th, 8th and 9th segment. When we compare however other numbers given by Vaillant, it seems that he has been mistaken and has overlooked two segments; for according to his statement the testes would be situated in the 9th and 10th ring, while in all known species of Megascolex they are to be found in the 11th and 12th segment. That those species have not been found in the same country, but *P. posthuma* is a native from Java and *P. affinis* from Cochinchina can make no difficulty, since Perrier has found Earthworms from Cochinchina and the Philippine-Islands in the soil of Nice.

9) Nouv. Archiv. loc. cit.

10) The Perichaeta-specimen described in my paper »Niederl. Arch. f.

of the buccal segment, dilating at the anterior part. Orifices of the copulatory pouches at the ventral side between the 5th and 6th, 6th and 7th, 7th and 8th, 8th and 9th segment. The 10th ring striking by its great length. The 14th, 15th and 16th segment compose the girdle, which is characterized not only by its lighter colour, but also by the total absence of bristles. Orifice of the oviduct in the middle of the ventral side of the 14th segment. Male genital orifices on the 18th segment on two papillae, placed in the circular row of the bristles. There are no papillae in the vicinity of the genital pores, as are to be found in *M. posthumus* Vaill. I only observed a single pair of papillae near the orifices of the copulatory pouches on the 7th and 8th segment in specimens from Java. Dorsal pores are distinct behind the girdle. The number of setae on each segment amounts to 42 and 48, and is nearly the same in the different regions of the body; on the contrary their length shows great differences, those on the ventral side being sometimes twice as long as those on the back.

The alimentary tract beginns with a large pharynx, which extends to the fourth septum; its whole surface is covered with glandules. The oesophagus occupies the 5th, 6th and 7th segment; in the fifth segment it is provided with two large glands, while in the 5th and 6th segment there are also two other groups of spirally wound glands on the anterior side of the septum. 1)

Zool: Bd. IV" belongs to this species; in writing this essay and also that in „Midden-Sumatra etc." loc. cit., I had not yet been able to clear up the question of synonymy of Perichaeta and Megascolex and therefore used the first name.

1) In my paper „Uber eine Perichaeta von Java" l. c., the remark was made that I could not find the openings of these glands in the oesophagus, and I put to question if those openings did really exist, as stated by Perrier; I had overlooked that Perrier in his Memoir on the „Organisation des Urochaeta", (Arch. Zool. Exp. T. III) suggested that those glands should discharge their secretion not in the oesophagus but in the body cavity. Instead of enjoying himself that we had come to the same conclusion, Perrier takes my remark amiss and denies ever having said that these glands open in the oesophagus.

Behind the oesophagus a large muscular stomach is to be found, placed between the seventh and tenth septum; the eight and ninth dissepiment are wanting and instead of them only some tendinous fibres extend from the intestine to the body-wall.

The four pair of copulatory pouches are situated in the 6th, 7th, 8th and 9th segment; each pouch consists of two parts: a large pear-shaped vesicle, opening outwards by a short, thick-walled canal and a small oval one,

To vindicate the justness of my observation I may cite his own words from the Compt. rend. T. LXIII, 1871, p. 278 (Sur l'organis. des vers du genre Perichaeta): „dans l'Oesophage viennent s'ouvrir: 1° Trois groupes de glandes, appuyées sur les cloisons qui séparent le troisième (?) anneau du sixième, le sixième du septième et le septième du huitième: ces glandes sont formées de tubes isolés, flottants, se recourbant en anses et dont les deux moitiés sont enroulées en spirale l'une autour de l'autre; 2° etc.

Perrier also contends my assertion that not he but Ray Lankester firstly observed in Lumbricus the vaisseaux latéraux (intestino-tégumentaires); his assumption however that those vessels would have been observed firstly by d'Udekem is not quite exact, the figure of d'Udekem relating on Perichaeta not on Lumbricus, and that he really makes claim of priority on this point may be prooved by his words: Bien que les recherches etc., tels par exemple que l'existence dans les Lombrics des troncs latéraux qui n'avaient jamais été indiqués (Organ. des Urochaeta p. 483).

But I rather like to pass by these questions of priority, of so little value for a scientific man, and prefere to call attention to some opinions in Perrier's paper on Pontodrilus, which are quite contradictory to the results of the investigations of other authors. So on page 221 we read „car, outre que le sang des Lombrics ne contient pas de corpuscules". Now I believe that Ray Lankester by his investigations (Quart. Journ. Micr. Sc. Vol. XVIII, 1878 p. 68, pl. X) has convincingly shown the presence of corpuscules in the blood of the Earthworm. Perrier also seems to doubt the exactness of the assertion, that the glands of the Oesophagus (glands of Morren) secrete carbonate of lime, because he says p. 200: on a designé quelque-fois à tort ces glandes sous le nom de glandes calcaires; elles n'en contiennent pas nécessairement et l'on ne voit pas d'ailleurs quel rôle le calcaire etc. However the presence of lime in those glands is so often demonstrated by several investigators (Morren, Ray Lankester, Claparède, and my self, Tijdschr. Ned. Dierk. Ver. Dl. III, p. 49), that there is no question about its really existing, though the signification of that product for the organism is dubious; and how is it possible to deny the presence of some product in the animal organism, only because we do not know its function? can we say for instance what is the function of the crystalline stylet in the stomach of some Lamellibranchiatae?

connected with the other by a long, narrow tube. It must be mentioned that in several specimens (from Soepajang) I found another tube joined with the efferent duct of the small vesicle, nearly in the middle of its length, the copulatory pouch being thus here composed of three parts. However this difference seems not to be of great value, because this second tube shows different degrees of development, and has often only the shape of a small caecum.

The testicular sacs, consisting of four lobes, are placed in the 11th and 12th segment; from each lobe a tube issues beginning with a funnel-form mouth. On a small distance from their origin the two tubes on each side of the body are uniting in a single vas deferens. This vas deferens joins the muscular duct of a prostatic gland, which opens in the male genital orifice.

Length of the largest specimen 120 m.m.; number of segments 100.

Hab. Sumatra (Alahan Pandjang, Silago, Soepajang) and Java.

Probably some of the specimens of *P. cingulata* examined by Vaillant, are identical with *M. indicus*; however Vaillant, as stated by Perrier, having confounded different species under this name, and moreover Schmarda's description of *P. cingulata* being too incomplete to make recognition of this species possible, I think it more desirable to cancell that name.

Megascolex sumatranus n. s.

The copulatory pouches opening by two pair of slitshaped pores at the ventral side between the 7th and 8th, and the 8th and 9th segment. The male genital orifices situated on the 18th segment are surrounded by a plicated wall. The opening of the oviduct is very indistinct. The number of setae on each segment amounts to 38; only on the cincture they are wanting. Like in the preceding species there are to be found tubular spirally wound glands on the anterior side of the 6th and 7th septum. The muscular stomach is situated in the 9th and 10th segment;

in the 26th segment the intestine is provided with two caeca. The large copulatory pouches are placed in the 7th and 8th segment; they consist of two different parts: a large, oblong vesicle with a short efferent duct, and a small round pouch, connected with the former by a long screwlike wound tube. The small pouch contains an orange-coloured substance, which highly magnified appears to be a mass of densely crowded, slender, undulated threads, thickened at one end and which decidedly constitute the spermatozoa. In the 11th and 12th segment are placed the male genital organs, their vasa deferentia both are provided with a single funnel-shaped mouth, situated in the 11th ring, not free in the perivisceral cavity, but inclosed within the seminal vesicle. The prostatic glands are strongly developed, lobated, extending from the 17th to the 22th segment. The efferent duct of each gland is a short, thick-walled, S-like bended canal, that joins near its origine the vas deferens, and opens outwards on a cushion-like thickening of the bodywall.

Length 70 m.m.; number of segments 94.

Hab. Sumatra (Lebong).

Megascolex Hasselti n s.

This species differs from all *Megascolex*-species hitherto known by the characteristic arrangement of its bristles.

The cephalic lobe extends nearly over the whole length of the buccal segment.

Each ring bears 70 to 75 bristles; however they are not all placed on equal distances, as in other *Megascolex*-species, but on the ventral side about forty of them stand densely crowded together in two symmetrical groups, separated by a small interspace in the median ventral line. By this characteristic arrangement of the bristles *M. Hasselti* contrasts very remarquably with *P. luzonica* Perr. and *P. biserialis* Perr. ¹), in which the bristles just are

---

1) Compt. Rend. T. LXXXI.

wanting on the ventral side. This accumulation of bristles on the belly is associated with a strong development of the layer of circular muscles, that layer having a much larger diameter at the ventral than at the dorsal side.

The openings of the copulatory pouches are situated between the 5th and 6th, 6th and 7th segment; there is an indistinct orifice of the oviduct on the 14th segment. Each copulatory pouch consists of two parts: a large, elliptical vesicle, with a moderately developed duct, and a narrow, cylindrical tube, reaching nearly half the length of the large vesicle. In the 10th, 11th and 12th segment we find the testicular sacs; the vas deferens of each side beginns with two funnel-form mouths, the one placed in the 11th, the other in the 12th segment, both inclosed within the common coat of the genital organ; at its distal end the vas deferens is strongly dilated and joins the efferent duct of the prostatic gland, that opens on the 18th segment. The prostatic glands are extraordinarily developed, extending over five segments (17th—22th); they are superficially divided in a great number of polygonal lobes, resembling somewhat the lobed kidney of Phoca.

Length of the largest specimen 70 m.m.; number of segments 100.

Hab. Sumatra (Lebong).

Megascolex Sieboldi n. s.

Cephalic lobe rounded behind, reaching half the buccal segment.

Orifices of the copulatory pouches between the 6th and 7th, 7th and 8th, 8th and 9th segment; opening of the oviduct indistinct. Number of setae on each segment 80, but the cincture without bristles. There are no papillae on the ventral side. The dorsal pores are commencing between the 12th and 13th segment. The copulatory pouches are situated to the number of three pairs in the 7th, 8th and 9th segment; each of them consists of two parts: a large pear-shaped vesicle, with a short duct, and a tube, somewhat longer than the vesicle and plicated like in *P. Houlleti* Perr. Male genital organs placed in the 11th and 12th segment; prostatic glands large, divided in lobes by deep incisions. The 5th and 6th septum bear groups of glandular tubes on their anterior side; the 8th and 9th septum are wanting. In the 26th segment the intestine is provided on each side with six conical coeca, placed on a transverse series; the superior is the longest, extending forwards into the 21th segment and it seems to represent the single caecum of other *Megascolex*-species.

Length 270 m.m.; circumference of body 30 m.m.; number of segments 135.

Hab. Japan (von Siebold).

Megascolex japonicus n. s.

Cephalic lobe extending nearly over half the buccal segment, dilating at its anterior end.

Orifices of the copulatory pouches between the 6th and 7th, the 7th and 8th segment; opening of the oviduct distinct. First dorsal pore between the 11th and 12th segment. Instead of the two male genital pores on the 18th ring, there is on each side of the ventral median line a longitudinal thickening of the bodywall, having about the form of the letter J and extending over the 18th and half the 17th segment; over the middle of this ridge is running a groove, which consists of a long longitudinal and a short transversal part. In the latter part the genital pore is to be found and therefore we may suppose that the ridge has some function in the act of copulating. The number of setae on each segment amounts to 66. The two pair of copulatory pouches are situated in the 7th and 8th segment; each pouch consists of two parts, a large conical vesicle somewhat flattened at its posterior part, thus resembling a racket, and a very slender tube, reaching a little beyond the half of the vesicle. The testicular sacs in the 11th and 12th segment; there are two large, multilobed prostatic glands, extending over three segments (17th—19th), each opening by a S-like curved, thick-walled duct; the vas deferens of each side is joining this duct.

The anterior side of the 5th and 6th septum, like the inner-side of the body-wall of the 7th, 8th and 9th segment are densely covered with glandular tubes; as usual the 8th and 9th septum are wanting.

Length 220 m.m.

Hab. Japan (von Siebold).

Megascolex musicus n. s.

A. G. Vorderman, Bijdrage tot de kennis van den Sondarie-worm (Nat. Tijdschr. Ned. Indie, Dl. XLI, 1881).

Cephalic lobe extending nearly over the whole length of the buccal segment.

Each segment, except those of the cingulum, with a circular ridge, which carries the bristles to the number of 100. Orifices of the copulatory pouches between the 7th and 8th, 8th and 9th segment. Two large slit-shaped genital pores on the 18th segment; the opening of the oviduct is a small pore on the 14th segment. Between the 12th and 13th (or 13th and 14th) ring we find the first dorsal pore. The two pairs of copulatory pouches are situated in the 7th and 8th segment; each pouch consists of two parts, a large, pear-shaped vesicle with short duct, and a long tube rolled up in numerous windings. Male genital organs in the 11th and 12th ring; their vasa deferentia beginning each with two funnel-shaped mouths. There are two large prostatic glands, divided in numerous lobes. Bunch-like ovaries in the 14th segment, hanging on the posterior side of the 13th septum. The 8th and 9th septum are wanting, the second copulatory pouch therefore situated in the 8th as well as in the 9th ring.

The 11th, 12th and 13th septum are extraordinaily thick and muscular. Like in *Megascolex Sieboldi* the intestine is provided on each side of the 26th segment with six caeca, of which the superior is the longest; however this seems to be not a constant characteristic, in one of the specimens only the superior caecum being present.

Colour: above greyish-blue, lead-coloured, underside paler, rufous; girdle brownish; genital pores, mouth and vent yellowish.

Length 570 m.m.; circumference of the body directly behind the girdle 48 m.m.; number of segments 166.

Hab. Java (Kuhl & van Hasselt, Vorderman).

According the observations of Mr. Vorderman, who was kind enough to forward me two specimens for examination, those worms are living in the high mountain forests and make a sharp interrupted noise during the night.

Indigenous name »tjatjing sondarie".

Megascolex Schmardae n. s.

Cephalic lobe reaching about half the buccal segment.

Orifices of the copulatory pouches situated between the 7th and 8th, 8th and 9th segment; opening of the oviduct indistinct. The number of setae on each segment amounts to 62 or 64; on the girdle they are wanting. The two pairs of copulatory pouches are placed in the 7th and 8th ring; each pouch consists of two parts, a large globular vesicle, with a short duct and a moderately long tube, rolled together near its end in two or more windings. Testicular sacs in the 11th and 12th segment; each sac bears at its superior side a small lobe, situated within the common coat, but clearly distinguished from the remaining of the seminal vesicle by its white colour. The vasa deferentia are provided with two funnel-shaped mouths, one placed in the 11th, the other in the 12th ring. There is on each side a large half-moon-shaped prostatic gland, divided in numerous lobes, which opens outwards by a S-like bended, muscular duct on a very prominent cushion-like thickening of the body-wall; by this duct also the vas deferens discharges its contents.

Length 90 m.m.; number of segments about 90.

Hab. Japan (von Siebold).

Megascolex capensis n. s.

This species has been collected by Horstock at the Cape of Good Hope; there being only one specimen in a very bad state of preservation (the posterior part of the body is totally wanting), I regret to be not able to give many characters of this worm. There are two pairs of copulatory pouches in the 8th and 9th segment, opening between the 7th and 8th, the 8th and 9th ring. Each copulatory pouch consists of two parts, a large round vesicle, and a thick, cylindrical tube, more than twice as long as the vesicle and usually bended around it; over its whole length the tube has the same diameter, but near its free end it suddenly becomes narrower and ends in a small oval sac. A large prostatic gland, consisting of numerous slender lobes, opens by a feebly bended duct on a thickening of the bodywall in the 18th segment on each side. The pore of the oviduct is distinct on the 14th ring. Number of setae on each segment about 40.

Hab. Africa (Cape of Good Hope).

Megascolex annulatus n. s.

Cephalic lobe oblong, trapezoidal, extending over two thirds of the buccal segment.

Two pair of copulatory pouches in the 7th and 8th segment, opening with distinct orifices on the anterior part of these segments. Each copulatory pouch consists of two parts, a large globular vesicle with short duct, and connected with it a small tube, measuring about a fourth of the length of the vesicle. Male genital organs in the 11th and 12th segment slightly developed; a three-lobed prostatic gland on each side in the 18th segment, with S-like bended duct. The 8th and 9th septum are wanting; on the anterior side of the 5th and 6th dissepiment there are strongly developed glandules, with spiral windings. Opening of the oviduct distinct on the 14th ring. Number of setae on each segment about 65. The colour is blackish with a white ring around the middle of each segment.

Length 195 m.m.; number of segments about 130.

Hab. Malayan Archipelago (Kuhl & van Hasselt).